Environment and Spatial Planning
Ministry of Housing,
Spatial Planning and the Environment

Guidelines for the Environmental Impact Report Second Nuclear Power Plant Borssele

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In case of textual differences between the original document and this translation the original document is binding.

Colophon

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Contents

1 Introduction

Delta Energy B.V. (hereinafter called Delta) intends to construct and operate a new nuclear power plant near Borssele. The plan will require a licence under the Nuclear Energy Act, among other things. The Minister of Housing, Spatial Planning and the Environment, the Minister of Economic Affairs and the Minister of Social Affairs and Employment jointly form the competent authority for the Nuclear Energy Act.

The Minister of Transport, Public Works and Water Management and the Minister of Agriculture, Nature and Food Quality are also competent authorities because there will be discharges into surface water and the potential influencing of nature areas. Coordination is the responsibility of the Ministry of Housing, Spatial Planning and the Environment.

An Environmental Impact Assessment (E.I.A.)[1] must be undertaken to support decision-making on the application for the licence. These guidelines indicate how the Environmental Impact Report (EIR) must be drawn up.

Background
Initiator Delta states in its preliminary memorandum that the reason for building a new nuclear power plant is twofold. Firstly, Delta mentions making a significant contribution to fulfilling environmental objectives. Secondly, Delta says that it is a response to the development of the energy markets.

In the transition towards the use of more sustainable types of energy generation (solar, wind, water and biomass), there will continue to be a need for a reliable base load. Besides gas-fired stations, it is possible according to Delta to meet the demand for electricity by means of coal-fired stations with CO_2 storage (CCS) and nuclear power plants. In the longer term, Delta sees an important role for solar energy.

Environmental Impact Assessment
In June 2009 Delta published a preliminary memorandum for an Environmental Impact Assessment (E.I.A.) for the 'Second Borssele Nuclear Power Plant'. The purpose of the E.I.A. is to enable the competent authority to decide on an application for a licence under the Nuclear Energy Act. The Environmental Management Act makes an E.I.A. mandatory for a decision of this kind. The Environmental Impact Report (EIR) will describe the environmental consequences of the planned activity and of the various alternatives in accordance with the guidelines.

Guidelines
The competent authority has set out in these guidelines the environmental information that the Environmental Impact Report (EIR) must contain to factor environmental interests into the decision on a request for a licence under the Nuclear Energy Act.

When drawing up the guidelines, the competent authority took into account the responses received during the consultation on the preliminary memorandum and the recommendations for the guidelines, insofar as they concern the study. The preliminary memorandum provides supporting evidence and a description of the planned activity.

1 The Environmental Impact Assessment (E.I.A.) is a procedure to investigate the consequences of certain activities for the environment before those activities are performed; an Environmental Impact Report (EIR) is the product of the E.I.A. that describes the results of the E.I.A.

Procedure to date

On 29 June 2009, the competent authority received the preliminary memorandum for the Environmental Impact Assessment (E.I.A.) for the 'Second Borssele Nuclear Power Plant' from Delta. It has been established that the preliminary memorandum meets the substantive requirements contained in the Regulations for Notifications of Intent for Environmental Impact Assessments of 27 June 1985 (85/337/EEC). On 16 July 2009, a request for advice was submitted to the Netherlands Commission for Environmental Assessment and the statutory advisers.

Subsequently the competent authority publicly announced the preliminary memorandum by placing an advertisement in the Government Gazette and in several newspapers and free local papers in the Netherlands and Belgium. Moreover, all countries which are Parties to the Espoo Convention were informed about the initiative.

From 22 July 2009 to 16 October 2009 inclusive the preliminary memorandum was available for public inspection in various places in the Netherlands and Belgium and from that moment onwards it could also be perused on the website of the Ministry of Housing, Spatial Planning and the Environment. During this period everyone had the opportunity to respond to the preliminary memorandum both verbally and in writing. In this regard the competent authority also organised two information meetings, which were held on 24 and 26 September 2009. Because of the holiday period the usual time allowed for comments was extended by a number of weeks.

On 3 December 2009 the Netherlands Commission for Environmental Assessment published its advice on the EIR guidelines, after having read the points of view and recommendations received up to 16 October 2009.

For the competent authority, the preliminary memorandum for the E.I.A., the statutory requirements for the contents of an EIR, the advice from the Netherlands Commission for Environmental Assessment, all viewpoints submitted and other recommendations as well as external reviews by Royal Haskoning and International Safety Research Europe formed the basis for the contents of the present EIR guidelines.

How to use these guidelines

Chapter 2 describes the scope of the EIR and the fundamental matters that must be covered in the document. This chapter also deals with the background to Delta's initiative for constructing a nuclear power plant and the choice of Borssele as a location. Chapter 3 defines the objective of the initiative and also the policy framework for examining the decisions that need to be taken.

Chapter 4 looks in more detail at the planned activity, such as the basic principles for the type of nuclear power plant, the working of a nuclear power plant and the use of nuclear fuels. This chapter further describes the alternatives that should be worked out. Chapter 5 indicates how the reference situation must be described based on the existing environmental situation and the autonomous development to be expected. Moreover, this chapter defines the planning area and the study area.

Chapter 6 addresses the description to be included in the EIR of the environmental consequences of the planned activity and of the alternatives for the various environmental components.

Chapter 7 indicates how the proliferation and social and economic effects and the gaps in environmental information must be dealt with. Moreover, this chapter states how the environmental effects must be monitored and describes the implementation of an evaluation programme. Finally, Chapter 8 describes the form that must be used for the EIR and the requirements imposed on the summary.

2 Scope and backgrounds of the EIR

2.1 Scope of the EIR

2.1.1 General

These guidelines concern the EIR for the required license applications. This makes it a decision-making EIR. A separate spatial planning procedure will be undertaken for alteration of the zoning plan, with a Strategic Environmental Assessment (SEA). The guidelines in this document were not drawn up for this future SEA.

A nuclear power plant may affect the environment nationally and internationally. To make this transparent, the environmental effects in the Netherlands, in Belgium and, if applicable, in other countries must be described separately in the EIR.

2.1.2 Scenarios for electricity production

The discussion about the usefulness and necessity of nuclear energy within Dutch energy policy does not fit into the framework of an individual application for a licence. However, Delta must give reasons in the EIR for why, based on its vision and business model, it has opted for (a larger proportion of) nuclear energy. Address the position of nuclear energy within Delta's current and envisaged fuel mix and state reasons for the intended proportion of nuclear energy. Define the criteria that Delta applies when choosing fuel.

Describe, based on a realistic business model and within Delta's competence, one or more scenarios with a fuel mix without extra capacity for nuclear energy, i.e. with a combination of gas, coal and wind, for instance, or fully based on a single type of generation. Base the scenarios on the capacity for which the licence is being requested (up to 2500 MWe).

Partly to address the different views that exist, the scenarios must not be confined to a coal-fired power station with CO_2 storage (CCS), and must in any event include the large-scale generation of wind energy at sea.

Base the comparison of the scenarios with the planned activity on the aspects 'affordable', 'reliable' and 'clean' as described in the '2008 Energy Report' of the Balkenende IV Cabinet, as well as in the report entitled 'Brandstofmix in beweging. Op zoek naar een goede balans' ('The Dynamics of the Fuel Mix. Searching for a Proper Balance') issued by the Dutch Energy Council in January 2008, making use of data, studies and reports which are already available. It will not be necessary to perform new research in this regard.

In the comparison concerning the aspect of 'reliable', make a distinction between security of provision (short-term interruptions that may arise due to failure of energy plants or grid connections) and security of supply (interruptions due to shortages of fuel caused by structural scarcity, geopolitical instability or dependence on problematic supply routes). For the aspect of 'reliable', distinguish between absolute price level (including expected developments in the long term) and susceptibility to energy price variations.

For the EIR the comparison of the scenarios with the planned activity on the aspect of 'clean' naturally plays an important role. In this respect a number of factors are important, including:

- greenhouse gas emissions: the discharge of CO_2 and other greenhouse gases;
- emissions of other substances, like NO_x, SO2, particulate matter and radioactive substances;
- (radioactive) waste and other residues;
- gross and net energy efficiency;
- other environmental aspects, such as loss of biodiversity, landscape deterioration, thermal load on surface water, subsidence and visual amenity.

During a comprehensive comparison of the various scenarios all these effects should ideally be taken into consideration. In practice this is difficult because quantification is not always possible. When evaluating the scenarios, focus mainly on emissions of CO_2 (fossil and short-term) and other greenhouse gases. Compare these with the applicable policy goals for greenhouse gas reductions. Describe the other environmental consequences based on the available quantitative and qualitative data. Insofar as possible, use the same basic principles for the environmental conditions.

The environmental effects of the scenarios must be compared with the planned activity, dealing to the fullest possible extent quantitatively with the entire chain associated with the type of generation, i.e. from the extraction of fuel to the final storage of radioactive waste and including the necessary transports.

2.1.3 Nuclear fuel chain and lifecycle of the nuclear power plant

Nuclear fuel chain

The generation of electricity in a nuclear power plant is part of a chain of activities (the 'nuclear fuel chain'). The EIR must describe the entire nuclear fuel chain. Consequently, the following steps must in any event be covered:

- uranium mining;
- conversion and enrichment;
- transport of enriched uranium and plutonium for the purpose of manufacturing subelements;
- inward movement of nuclear fuel to the nuclear power plant;
- operations of the nuclear power plant;
- outward movement of spent nuclear fuel;
- reprocessing of the nuclear fuel;
- quantity and composition of radioactive waste;
- transport, storage and final storage of radioactive waste.

The EIR must describe the environmental pros and cons of all parts of the nuclear fuel chain, although not all at the same level of detail. The environmental consequences of the parts of the chain for which Delta is applying for a licence should be examined and defined in detail and specifically for the location concerned, both for the construction phase and for the operational phase. This primarily concerns environmental consequences of the activities which are directly associated with the nuclear power plant's operations. The description of the environmental consequences of the traffic and transport streams to and from the nuclear power plant relates to those streams within the Netherlands.

Uranium mining, enrichment, reprocessing, transports outside of the Netherlands and storage of radioactive waste (including final storage) are not parts of the planned activity. They will be carried out by other parties and separate licensing procedures have been, are being or will be followed for these activities. However, these activities are inextricably linked to the planned activity. The environmental consequences of these parts of the chain must be described in the EIR based on the available generic and quantitative data.

As it is evident from various expressed views that considerable concern exists about the storage and final storage of radioactive waste, special attention must be devoted to this matter.

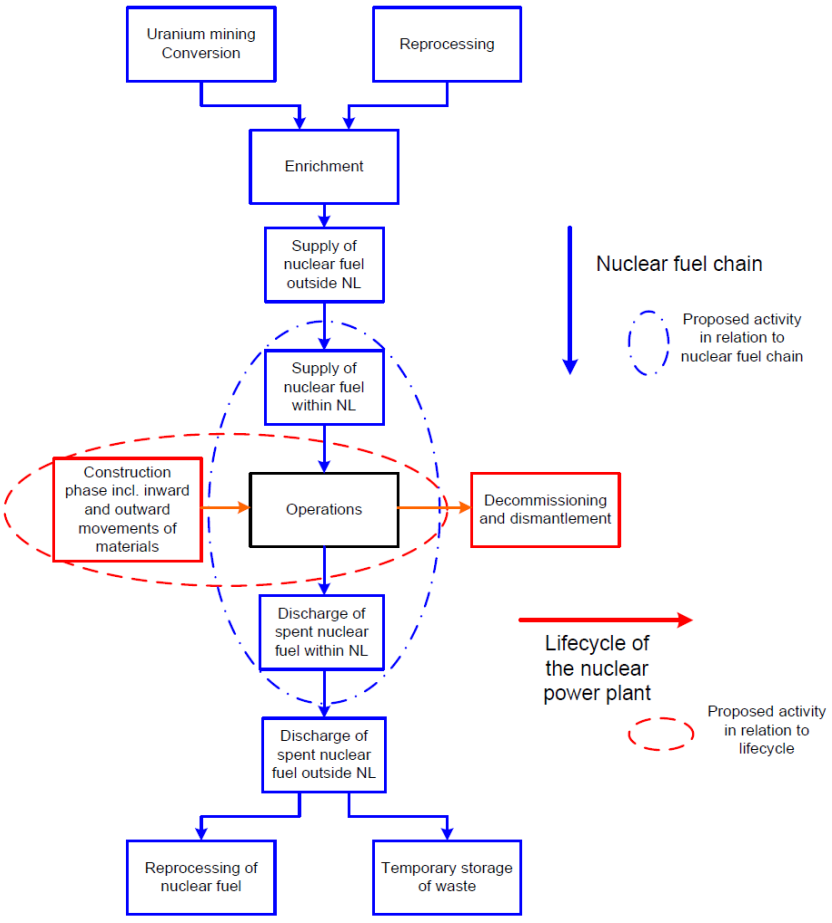
Lifecycle of the nuclear power plant

The lifecycle of the nuclear power plant consists of various phases, i.e. construction of the nuclear power plant, the operational phase, decommissioning and dismantlement. The construction phase and the operational phase of the nuclear power plant are part of the present procedure. In the EIR the environmental consequences of these phases must be examined and defined in detail and specifically for the location concerned.

For the decommissioning and dismantlement of the nuclear power plant a separate licensing procedure will need to be completed in due course. A detailed dismantlement plan will then be drawn up for that purpose. As the decommissioning and dismantlement of the nuclear power plant are inextricably linked with the planned activity, the expected environmental consequences must be described in the EIR based on the available generic and quantitative data.

Diagram

The diagram below shows the scope of the EIR in relation to the nuclear fuel chain and the lifecycle of the nuclear power plant. The components which are part of the planned activity have been encircled.



2.2 Choice of Borssele as a location

The Third Electricity Supply Structure Plan (SEV III) states three designated locations for nuclear power plants, namely Borssele, Maasvlakte I and Eemshaven. Delta has chosen one of the three designated locations for its plan, i.e. Borssele.

The choice of Borssele as a location has been explained in the preliminary memorandum. In the EIR this explanation must be included and where necessary it must be updated. The guidelines assume that Borssele will be the location. A specific site for the nuclear power plant has not been definitively established. In the EIR the final choice must be explained.

2.3 Usefulness and necessity of the planned activity

The plan is to generate electricity with an installed power capacity of at most 2500 MWe by constructing and operating a nuclear power plant. Validate the need for this large amount of power based on scenarios for the development of the demand for electricity, in combination with existing and already planned production capacity, both on a North-West European scale and on the Dutch scale.

Validate the choice of central generation of the chosen scale. Address the potential consequences for local generation initiatives. Describe in this context how this scale fits in with the (planned) transmission capacity for electricity in the Netherlands.

Indicate whether there will be any need to enlarge the grid and whether additional electricity lines will be necessary to transmit electricity to Belgium. Make use of the available data and plans of the relevant grid operator(s).

2.4 Main points of the EIR

The following matters are considered essential information in the EIR. The EIR must therefore in any event contain information about these matters to allow the weighing up of environmental interests in the decision-making process:

- the reasons for the plan (need for electricity, planned capacity and chosen scenario for electricity production);
- a description of the environmental impact on the entire lifecycle of the nuclear power plant, in detail and location-specific for the construction and operational phases and based on available generic and quantitative data for the decommissioning and dismantlement phases;
- a description of the environmental impact of the entire nuclear fuel chain, which should be detailed and location-specific in respect of the parts for which a licence is being requested, and as far as possible quantitatively on the basis of available generic data for the other parts of the chain;
- a description of the safety situation during normal operations and in the event of various accident scenarios, as well as the physical and organisational measures for assuring safety;
- the consequences for the Natura 2000 area of Westerschelde & Saeftinghe;
- a description of cross-border environmental and safety effects.

The sections that follow will state in more detail the information that should be included in the EIR.

3 Purpose, policy and decisions

3.1 Purpose

The purpose of the plan is to generate electricity with an installed power capacity of at most 2500 MWe by constructing and operating a nuclear power plant (consisting of one or two units, depending on which supplier is chosen) on a site yet to be selected at the designated location of Borssele in SEV III.

Describe the criteria that will be applied in the design of and decision-making about the plan. Elaborate these criteria in the EIR to establish criteria that enable examination of the extent to which the goal will be achieved.

3.2 Policy framework and decision(s) to be taken

The EIR will be produced for the purpose of decision-making on the application for a licence under the Nuclear Energy Act. Address in the EIR the decrees and regulations associated with the Nuclear Energy Act and the pursuant preconditions.

Deal with all relevant documents that will or may influence decision-making. This concerns laws and regulations as well as any relevant policy at the international, national, regional (province and water authorities) and local (municipal) level, using the most recent data as a basis.

A non-exhaustive list of such documents is provided below:

General
- Nuclear Energy Act (KEW) with associated decrees:
  - Radiation Protection Decree (Bs)
  - Nuclear Power Plants, Nuclear Fuels and Ores Decree (Bkse)
  - Transportation of Nuclear Fuels, Ores and Radioactive Substances Decree (Bvses)
  - Import, Export and Transhipment of Radioactive Wastes and Spent Nuclear Fuels Decree (formerly Biudra)
- Water Act (replacing, among other things, the Pollution of Surface Waters Act and the Water Management Act)
- Nature Conservation Act 1998
- Environmental Management Act (non-nuclear aspects)
- Spatial Planning Act and other spatial policy frameworks
- Electricity Supply Structure Plan (SEV III)
- General Administrative Law Act
- Electricity Act 1998
- Fourth National Environmental Policy Plan
- Integrated Pollution and Prevention (IPPC) guidelines, particularly with regard to the application of Best Available Techniques (BATs)

Radiation policy
- Policy Memorandum on Radioactive Waste 1984
- Nuclear safety rules
- Ministerial Order on the Assessment of Consequences of Ionising Radiation (mr-AGIS)
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- Euratom Treaty (European law)
- EU legislation concerning the transport of radioactive substances and waste

- Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel
- Directive 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation
- Recommendation 1999/829/Euratom
- Non-Proliferation Treaty
- Convention on the Physical Protection of Nuclear Material
- Convention on Nuclear Safety

Risk policy
- Risk of Serious Accidents Decree
- External Safety of Installations Decree
- Practical Treatment of Risks Report

Soil and groundwater
- Soil Protection Act
- Dutch Soil Protection Directive

Wastewater and cooling water
- Guidelines of the Integral Water Management Committee (CIW)
- Reference Document on the Application of Best Available Techniques to Industrial Cooling Systems
- LBOW evaluation system for heat discharges (2005)
- Guidance for cooling water issued by the Inspectorate of the Ministry of Transport, Public Works and Water Management (2005)
- CIW emission/immission evaluation system for substances and preparations (2000)
- National Water Plan
- National Water Management Plan (Bprw)
- Decree on Quality Demands and Monitoring for Water (Bkmw)
- Water Framework Directive (KRW)

Air
- Air Quality Act
- Air Quality Assessment Regulation
- Netherlands Atmospheric Emissions Guidelines
- Air Quality Framework Directive

Noise
- Noise Abatement Act
- Ambient Noise Directive
- Noise Zoning Plan

Nature
- Flora and Fauna Act
- Birds Directive
- Habitats Directive
- Rules Governing the National Ecological Network
- Policy Document: Nature for People, People for Nature
- Flora and Fauna (Red Lists) Decree
- Rio Convention on Biological Diversity
- Berne Convention

Landscape, cultural heritage and archaeology
- Belvedère Policy Document
- Government Policy on National Landscapes
- Green Space Structure Plan and Spatial Planning Memorandum
- Malta Convention

Provincial policy

- 10-point Plan for the Province of Zeeland's Nature Conservation Policy
- Province of Zeeland Nature Conservation Areas Plan
- Risks in Perspective
- Energy and Climate Framework Policy Document
- Continuous Culture cultural policy document
- Detailed Cultural Heritage and Monuments Policy Memorandum
- Province of Zeeland Regional Plan 2006-2012

Indicate in the EIR which other decisions must yet be taken in order to carry out the plan, i.e. both the follow-up decisions and the spatial planning procedures. Indicate which decisions must yet be taken for the reprocessing of spent nuclear fuels and for assuring storage of radioactive waste. Address the relation between the decisions and the decommissioning and dismantlement licences that in due course will have to be requested[2].

2 Delta has indicated that a licence will be requested only for setting up and operating the establishment.

4 Planned activity and alternatives

4.1 General

The planned activity consists of constructing and operating a new nuclear power plant at the designated location of Borssele. In addition to the primary and secondary systems the nuclear power plant will also comprise the support and emergency systems such as cooling water systems, systems for spent fuel and radioactive waste, offices, maintenance and training facilities and electrical (distribution) systems.

The planned activity and the alternatives must be described insofar as they have safety and environmental consequences. The level of detail chosen for the description must ensure that the relevant environmental consequences can be adequately portrayed.

State the reasons for the choice of the alternatives to be elaborated. To allow comparison, the environmental effects of the alternatives must be described according to the same method and at the same level of detail. A description of the most environmentally friendly alternative is mandatory. Indicate for each alternative whether preventive, mitigating and compensatory measures will be taken and, if so, which ones.

Identify the Best Available Techniques for the various parts of the installation and describe to what extent they will be used.

Make a distinction in the description between activities that will occur during the construction phase and those that will occur during the usage phase. Elaborate the specific environmental effects for both of the phases.

For the construction phase, describe at least the following components:
- preparation and set-up of the construction site;
- civil and architectural work;
- installation of structures, systems and components;
- commissioning and pilot operations;
- management, processing and discharge of construction waste;
- number and types of staff;
- events and accidents.

For the usage phase, describe at least the following components:
- reactor and nuclear safety systems;
- steam systems;
- production and distribution of electricity;
- process water and cooling water systems;
- materials management (fuel rods and chemicals);
- management of radioactive substances (spent fuel and radioactive waste);
- management of non-radioactive waste (solid, liquid, gaseous);
- maintenance and replacement;
- local support services (security, fire fighting);
- number and types of staff;
- events and accidents.

4.2 Description of planned activity

4.2.1 Choice of type of reactor

The preliminary memorandum is based on a 3rd generation reactor. State the criteria that were applied when making that choice, including environmental criteria. Explain the advantages of a 3rd generation reactor compared to previous generations. Describe the state-of-the-art for 3rd generation reactors. Address in brief the principles and the expectations concerning "generation 3+" reactors[3].

Describe the different types of 3rd generation reactors that exist. Validate why a pressurised light-water reactor was chosen. Validate why for safety and environmental effects it makes no difference which type of pressurised light-water reactor is chosen. If there *might* be significant differences in environmental and safety effects, the other types of pressurised light-water reactor must be worked out as alternatives.

4.2.2 Safety principles

Describe the safety principles that will be applied. Provide this description in general terms in a way that allows the public at large to understand how safety will be assured. Address both the technical side of the installation and the organisational elements. The following are considered organisational elements: organisation structure, lines of communication and safety culture. Refer to the safety report for details where necessary. If reference is made to classified documents for validation of the safety principles, state the documents concerned and indicate to whom they are accessible.

4.2.3 Location, design and operation

The description of the planned activity must be geared to the licence applications to be submitted together with the EIR. The EIR must therefore describe the envisaged location stating the exact coordinates, site boundaries, potential entrances and exits, topographical aspects present and height data. Also indicate whether or not the site is located beyond the dikes.

Indicate which design criteria will be used and what period of operation is assumed based on the technical lifespan of the nuclear power plant. In addition, general mass and energy balances of the planned activity must be elaborated, describing and quantifying the main inbound and outbound mass and energy flows.

The proposed operations must be described. The following aspects at the very least must be covered:

- method of monitoring radioactive emissions;
- nuclear fuel chain and use of nuclear fuel (type, quantity, etc.);
- periodic refuelling;
- testing and maintenance of primary, secondary, auxiliary and emergency systems;
- electricity production and connection to the electricity grid;
- temporary storage and possible processing/conditioning of radioactive waste;
- measures for protecting people and the environment against ionising radiation;
- measures for protecting employees against ionising radiation;
- storage and treatment of non-radioactive waste.

Describe the flexibility of nuclear power plants (based on reports and figures) and analyse the environmental effects that accompany the regulating of electricity up and down depending on the demand for electricity (load following). Also describe the influence of upward and downward adjustment on the life of the nuclear power plant.

3 As mentioned in documents including the *Advies Kernenergie en een duurzame energievoorziening* (Advice on Nuclear Energy and sustainable energy) of the Social and Economic Council of the Netherlands (SER) of March 2008.

4.2.4 Nuclear fuel cycle

The nuclear fuel cycle comprises the industrial processes used to produce new fuel, the processes used to remove spent fuel from the nuclear power plant (whether or not with a view to recycling uranium and plutonium) and finally the storage of residues.

DELTA is aiming for a so-called 'closed' nuclear fuel cycle. This means that spent fuel will be reprocessed in a reprocessing plant and that the uranium and plutonium products will be reused to the maximum possible extent. When an 'open' nuclear fuel cycle is used, the spent fuel is not re-used but rather treated as radioactive waste.

Describe in the EIR the pros and cons of a closed nuclear fuel cycle as opposed to an open nuclear fuel cycle. Address the consequences as regards the environment, safety and proliferation. Take into consideration all steps in the nuclear fuel cycle. Give reasons for Delta's choice of a closed cycle.

Enrichment, reprocessing and radioactive waste storage (including final storage) are not parts of the planned activity, but are inextricably linked to the planned activity (see Section 2.1.3). Describe how, where and by whom these activities will be performed. Address the possibilities that exist at COVRA (Centralised Organisation for the Storage of Radioactive Waste) and at reprocessing plants. Indicate whether the extra quantities of reprocessed nuclear fuels and radioactive waste fall within the physical and license capacity. Describe which procedures must yet be completed in this respect.

Address the possibilities for storage of radioactive waste (including final storage). Indicate which options are currently envisaged, how likely they are, which steps must be taken and who is responsible for them.

4.2.5 Transport of nuclear fuels, (radioactive) waste and other transport streams

Describe all traffic and transport streams to and from the nuclear power plant in the construction and operational phases. Describe the transport streams according to the transport function. Address the nature of the transported materials, the means of transport, the frequency on an annual basis, quantities (for each individual transport movement and on an annual basis) and destinations. State the measures that will be taken to assure safety.

Describe the parties responsible for and the responsibilities that exist during transports.

4.2.6 Conventional installation

Also describe in the EIR the non-nuclear part of the installation, including the steam cycle, the cooling water cycle, non-radioactive waste, water treatment, waste water treatment, emergency power and other support systems. Address the pressure and temperature of the produced steam and the targeted net and gross efficiency.

Address any possibilities for increasing the nuclear power plant's energy efficiency. Provide an overview of the possibilities for increasing the thermal effectiveness, including the use of residual heat, improved insulation and optimisation of turbine effectiveness. Moreover, describe the possibilities for marketing residual heat by charting the demand for heat among local industry and households.

4.2.7 Cooling

Describe the potential locations for taking in and discharging cooling water, taking into account any sensitive ecological or hydrodynamic environmental aspects. The description should address, among other things, mussel beds, brooding locations and consequences for currents and tides. State the reasons for the final choice of location and indicate it accurately on a map. Also describe how the system will be installed.

As regards the taking in of cooling water, address the inlet structure, intake flow rate (m^3/s), intake speed, intake temperature and the inlet depth at high water and at low water. As regards the discharge of cooling water, address the discharge structure (width, height, depth of the discharge), outflow flow rate, outflow speed, outflow temperature and the hot water plume.

Describe possible types of off-shore and on-shore inlet structures and the technical and environmental pros and cons, with regard to efficiency or the sucking in of fish, for instance. These types may be part of the alternatives.

It should be clarified whether use can be made of the existing inlet and outflow structures of the first nuclear power plant at Borssele. If this is a possibility, describe in the EIR the consequences of combined and non-combined inlet and outflow.

Describe the various technologies that can be used to prevent marine species from entering the installation (filters) and to rid the installation of deposits of fauna by means of coating, the thermoshock method and chlorine.

Various viewpoints expressed show that concerns exist about the landscape effects of possible cooling towers. Address the possibility of the construction of cooling towers. If cooling towers are considered as a realistic alternative, they must be described in the EIR as regards their location, height and landscape and visual impact and as regards the technology and influence on the achieved efficiency.

4.2.8 Construction work

Describe the construction activities, the sequence in which the various parts of the building site will be developed and the total duration of the construction phase. Address any pile-driving and drainage activities.

As regards the location's accessibility by road and water during construction, the EIR must deal with developments that will or may occur in the construction phase in and around the Vlissingen-Oost seaport site (insofar as reasonably known), such as:

- an overview of further usage of the seaport site (particularly containerisation) with the accompanying traffic flows by water, rail and road;
- an increase in the wind turbines at the seaport site;
- construction of infrastructure in the immediate vicinity of the seaport site, which may cause inconvenience in the construction phase and may also necessitate extra traffic movements.

If a temporary building site will be set up at the seaport site in the construction phase – i.e. one unrelated to the building site for a second nuclear power plant – its influence on the environment and on safety must be included in the EIR. Describe the location of the temporary building site, including the entrances and exits as well as the expected transport movements.

4.2.9 Decommissioning and dismantlement

Outline in the EIR (in accordance with Section 2.1.3) how decommissioning and dismantlement will take place and what environmental consequences and possible dangers can be expected as a result. Demonstrate that the envisaged methods of decommissioning and dismantlement are feasible by means of existing technology and that the site can be left in a condition that ensures that future use will not be hampered by the fact that a nuclear plant used to be operational there.

Describe the compositions and quantities of the various types of waste and residues – both radioactive and non-radioactive – that will be released. Describe how these types of waste and residues will be dealt with. Also address the scheduling currently envisaged for decommissioning and dismantlement.

4.3 Alternatives

4.3.1 Location alternatives

The preliminary memorandum (Section 3.2) states that the precise site of the nuclear power plant within the designated location of Borssele has not yet been chosen. The final choice of location should be substantiated in the EIR. If the various sites might result in significantly different environmental effects, these sites must be worked out as alternatives and their environmental effects must be described.

4.3.2 Design alternatives

Base the design alternatives for nuclear production of electricity on the qualifying technical possibilities, such as (but not limited to):
- the type of 3rd generation pressurised light-water reactor chosen;
- the facilities for further reducing noise emissions;
- alternative cooling by means of cooling towers;
- alternatives for taking in and discharging cooling water (including variants for the cleaning techniques);
- alternative nuclear fuels;
- no reprocessing of spent nuclear fuel.

State the reasons for the choice of the alternatives to be elaborated. Consider in the description of effects the total nuclear fuel chain in general terms. A description of the nuclear fuel chain can be found in Section 2.1.3 of these guidelines.

A uniform, consistent approach must be used when evaluating environmental effects in order to allow comparison with the alternatives.

When making the comparison, factor in experience gained abroad, particularly in countries where the environmental limitations and the evaluation framework are similar.

4.3.3 Most environmentally friendly alternative

The most environmentally friendly alternative (MEA) must:
- be based on the best existing possibilities for protecting and/or improving the environment;
- fall within the competence of the initiator.

The MEA may focus on a nuclear power plant, so the 'scenarios for electricity production' mentioned in Section 3.2.2 of these guidelines do not need to be factored into the MEA. The MEA can be elaborated on the basis of the capacity for which the licence is being requested.

The MEA is a combination of elements from the implementation alternatives that offer the best possibilities for protecting the environment. The following matters are in any event important when choosing the most environmentally friendly alternative:

- shortening of the life of radioactive waste;
- further possibilities for increasing safety;
- minimisation of the effects on nature (including aquatic nature), for example by means of the location and design of the cooling water intake and the cleaning of the cooling water system;
- maximisation of energy efficiency, for example by using residual heat;
- mitigation of effects on the landscape of the 'Zak van Zuid-Beveland' area, which is considered to be historically valuable.

Pay attention to the possible use of control measures as well, meaning structures, processes or systems which are responsible for elimination, reduction or control of the planned activity's adverse effects on the environment. Control measures include compensation for any damage to the environment through replacement, restoration, financial compensation or any other means. Systems or functions which are inherent in the design of the nuclear power plant as a mechanism to protect the environment should not be regarded as control measures here. These systems or functions must be addressed during the initial assessment of effects.

5 Existing state and autonomous development

5.1 Study area and planning area

Clearly indicate the study area and the planning area on a map. Describe the study area containing the location of the initiative and its surroundings insofar as the direct, indirect and cumulative effects of the planned activity may occur. Include descriptions of locations with significant environmental characteristics (e.g. special habitats).

The definition of the study area must at least incorporate the following:
- the physical scope of the project, including any installations or activities that will occur outside of the facility's premises;
- the extent of the aquatic and terrestrial ecosystems that may be affected by the planned activity;
- the extent of the potential effects of noise and emissions into air and water as a consequence of the planned activity;
- areas which are used by communities for residential, commercial, industrial, recreational, cultural and aesthetic purposes and which fall within the boundaries of the project.

Describe the planning area. This is the area where the activities will take place and where direct effects can be expected. This area comprises the site of the envisaged nuclear power plant and the associated infrastructure. The description of the planning area and its surroundings must be characterised by the environmental aspects present.

5.2 Reference situation

The reference situation forms the basis for the description and the consideration and evaluation of the environmental effects of the planned activity and the alternatives. Describe for this purpose the existing condition of the environment in the study area and the likely environmental condition as a result of autonomous development by way of reference for the expected environmental effects.

'Autonomous development' is understood to mean the future development of the environment, without implementation of the planned activity or one of the alternatives. Base this description on developments of the current activities in the study area or affecting the study area and of new activities about which decisions have already been reached. Include references to the current zoning plan and any longer-term regional plans (drawn up by the provincial authority, for example).

5.3 Determination of the existing condition of the environment

The existing condition of the environment can be described by collecting historical data and where necessary by means of survey methods. The initiator must ensure that all relevant national and local bodies have been approached in order to obtain all available information. The sources of all information must be included in the EIR.

If the available information is not sufficient to describe the existing area, the initiator will need to describe an environmental survey and monitoring programme to cover the gaps in the information. Include a description of the protocols for sampling and analysis methods and as well as supporting evidence.

If the data on the existing condition of the environment have been extrapolated or adjusted in any other way to describe the environment (for instance to describe the autonomous development), the modelling methods used and the uncertainties must

be described. If there are any gaps in the data on the current environmental condition and hypotheses have therefore been used, underpin that all assumptions used are conservative.

Radiation aspects
Describe the current level of gamma radiation and radioactive substances in all environmental components (e.g. air, water, soil, groundwater, food, sediments, plants and animals) within the study area. Quantification is only required for those sources of radioactivity of which the concentration in the environmental components is expected to rise considerably due to the project activities. For the description of the autonomous development, all sources of radioactivity in the immediate vicinity of the project will need to be identified, however.

Include a description of the total effective dose of radiation for humans (i.e. employees and the general population) in and around the envisaged location. This concerns the external gamma dose and the internal dose received via all relevant routes of exposure (such as inhalation, swallowing, etc.). For the determination of the internal dose of the general population, the corresponding food intake must be taken into account. If necessary, conservative estimates will need to be used.

Soil and groundwater
Because an existing nuclear power plant is in operation near the envisaged location, the EIR must describe the levels of all hazardous substances in the soil and sediment within the study area.

Describe the study area's hydrogeology. This description must include the physical and geochemical characteristics of hydrogeological units such as groundwater flow patterns and groundwater quality. Also include a description of any groundwater extraction for drinking water in the vicinity of the proposed location, including current usage and potential usage in the future.

Water
Include a description of the surface water quality and hydrology. The description must include the locations of catchment areas, water levels and flow rates based on historical data. Describe the seasonal and annual fluctuations in all surface waters, the normal flow rate, any floods and droughts. In addition, describe matters like depth data, substrates and water temperature profiles.

Describe all relevant interactions between surface water and groundwater, including all surface water extractions for drinking water near the envisaged location. The main water quality parameters included must correspond with the expected pollutants in surface water which may be emitted as a result of the planned activity during the construction and operational phases.

Air
Describe the current air quality in the study area. The main air quality parameters regarded must correspond with the expected pollution in the atmosphere due to the construction and operational phases.

Noise
Provide a description of the current ambient noise and vibrations in and around the area of the envisaged location. Identify all relevant sound and vibration sources and describe the geographical scale and variations in time. Pay attention to special objects like homes, hospitals, schools, etc.

Nature
Describe the terrestrial and aquatic species in the study area (both animals and plants) and their habitats. Describe for all animals any wildlife crossings, protection areas and critical habitats and for all animal species their natural conservation status

(e.g. rare, vulnerable, threatened, virtually extinct). For the aquatic environment, include descriptions of fish movements, migrations, spawning periods, etc.

Describe the climate conditions and the air quality in and around the area of the envisaged location. Include air temperature, relative humidity, precipitation, wind speed and wind direction and atmospheric pressure as meteorological parameters. Also describe weather phenomena like tornadoes, lightning, temperature inversions and fog.

Landscape and cultural heritage
Describe the existing landscape and visual environment, including views and panoramas in the area around the envisaged location. Include all functions of historical, archaeological, paleontological, architectural or cultural importance.

Geology
Describe the geological characteristics (e.g. rock and superficial geology, geomorphology, topography, petrology, geochemistry) which will probably be affected by the project. Describe the geotechnical aspects of the topsoil such as shear strength and flow potential, to enable evaluation of the slope stability and the load-bearing capacity of foundations.

Include in the EIR a description of the geotechnical and geophysical risks within the study area. These risks may include, among other things, soil settling, upward pressure, landslides and earthquakes.

6 Environmental effects

6.1 General

Use a systematic process to ensure that all environmental effects caused by the planned activity (including alternatives) are addressed and that all effects to be expected will be evaluated. The environmental effects of the planned activity and the alternatives must be described in detail and specific to the location.

The following general guidelines must be observed when assessing and describing the environmental effects:

Method of the environmental effects analysis:
- Describe the inventory and research methods used. Ensure that all models and methods used are scientifically justifiable and, preferably, accepted internationally.
- State uncertainties and margins of error in the prediction methods and data used. Also point to gaps in knowledge and their consequences for the assessment of effects. Wherever there are any uncertainties a description must be included of how conservative assumptions are being used.
- Describe the method and any criteria used to determine environmental consequences. This must be done in a clear, verifiable manner by including basic data in annexes or by making explicit references to background materials consulted. Use the most recent and best available scientific information for this purpose.

Assessment of effects of the construction and operational phases:
- Identify all sources of significant emissions based on the environmental components indicated in this chapter, including the radioactive and non-radioactive waste produced.
- Assess the significance of effects: extent, positive or negative, direct or indirect, geographical scope, duration (short, medium or long term), reversibility (temporary or permanent) and whether or not they are cumulative effects.
- Describe the period and frequency of each effect in relation to sensitive environmental aspects (i.e. sensitive to the effect) and the likelihood of the effect actually occurring.
- Express the effects in quantitative terms (surface areas, numbers) as far as possible. The effects must be assessed qualitatively only where they demonstrably cannot be expressed in quantitative terms.
- For significant effects, formulate mitigating measures or alternative construction methods to limit those effects as much as possible to an acceptable residual effect.

Cumulative effects:
- Explicitly address cumulation with effects of other current or historical sources, projects or realistic plans (which are in an advanced stage of decision-making).
- Describe the effects notably in Belgium and, if applicable, also in other countries (cross-border effects).

For the scope of the description of environmental consequences in connection with the nuclear fuel chain and the lifecycle of the nuclear power plant, refer to Section 2.1.3 of these guidelines. In the description of effects, distinguish between effects that will occur during the construction phase, effects that will occur during the usage phase and effects that will occur during decommissioning/dismantlement of the nuclear power plant.

6.2 Nuclear safety and radiation

6.2.1 Normal operation, events and accidents

Elaborate the effects on safety for normal operation, events, design accidents and beyond-design accidents as described below. Describe the principles that will be applied to assure safety during normal operation and in the event of accidents in a way that is comprehensible by the public at large.

Conservative principles must be applied when evaluating emissions and discharges during normal operation or as a result of design accidents, such as maximum power of the reactor unit, quantities and type of nuclear fuel and maximum burn-up.

Normal operation
The EIR must state the maximum doses of radiation for people in the vicinity. Present the collective doses for emissions from the ventilation shaft.

Describe how the discharge of radioactive substances and, independent of this, the concentrations of radioactive substances and doses of radiation in the vicinity are and will be checked. Describe how radioactive substances (gaseous, liquid and solid) at the nuclear power plant will be processed and/or removed and state the radiation exposure that will occur when this happens.

The radiological effects of emissions into air and discharges into water during normal operation must be calculated. The following data must be determined for the most exposed places in the Netherlands and Belgium:

- average annual activity concentrations in the air at ground level;
- activity concentrations in surface waters and consequences for groundwater;
- surface contamination.

Determine the corresponding annual effective dose(s) for the relevant reference group(s) of the population based on the Ministerial Order on the Assessment of Consequences of Ionising Radiation (mr-AGIS).

Discharges of radioactive substances into wastewater must be determined based on the best available techniques (BATs) for reducing residual activity. Describe the proposed measures and their effects in the EIR.

Nuclear power plants are already in service in Belgium (Doel) and in Borssele. Therefore, it is necessary to devote attention to the criteria for discharges and the cumulative aspect of the existing licences and those of the planned activity. The criteria must factor in the cumulative aspect for the individual risks of several discharges under normal operation, and also the probability of the simultaneous occurrence of events that might lead to intensified discharges. Perform a combined probability calculation to determine the likelihood of several events occurring at the same time.

Events
Events include events whereby the safety system is activated to restore the normal state. The installation may be restarted after correction of the cause of the fault. Events may occur several times during the service life of the nuclear power plant. These events will not be accompanied by abnormal discharges of radioactivity, i.e. any discharges will fall within the licensed limits. Demonstrate in the EIR that this will also be the case if events occur during the planned activity. A situation whereby the primary or secondary cooling system fails must be addressed.

Design accidents
A modern nuclear power plant is designed in such a way that the safety system will be activated in response to a number of presupposed events. This limits damage to the installation to such an extent that the nuclear power plant – if necessary after repair – can be restarted. In order to limit the consequences of this category of accidents to the fullest possible extent, it is necessary to use special technical safety measures. The EIR must include an overview of the most important design accidents that may be deemed relevant to the nuclear power plant and of their radiation hygiene effects on people and the environment.

The radiological effects of emissions and discharges caused by design accidents must be calculated. These reference accidents must be defined in the EIR and reasons must be given for choosing these particular reference accidents. The following data must be determined for the most exposed places in the Netherlands and Belgium:
- maximum concentrations, integrated over time, of the activity in the atmosphere at ground level;
- maximum deposits on the ground (during dry weather and during rain).

Determine the corresponding maximum effective dose(s) for the relevant reference group(s) of the population, taking into account any significant routes of exposure (also see Recommendation 1999/829/Euratom – Annex 1, Section 6).

Beyond-design accidents
The safety review of a nuclear power plant must also assume that accidents are possible that will be more serious than design accidents. These are called beyond-design accidents. When highly improbable accidents of this kind occur, the reactor can no longer be properly cooled and passive safety facilities (like the building that acts as a containment system) must limit the effects for the vicinity. The PSA (Probabilistic Safety Assessment) method must be used to indicate the effects of beyond-design accidents. A PSA is a safety analysis that examines the probabilities, course and consequences of serious accidents.

When describing the consequences of the accidents, at least take the following external influence factors into account (the list is not exhaustive):
- earthquakes;
- extreme weather conditions;
- crashing aircraft;
- intrusion, damage/sabotage to the installations;
- flooding of the site combined with the expected sea level rise due to climate change.

Describe in the EIR, where possible and meaningful, the influence of the plan and examined alternatives on the risks that exist.

6.2.2 External calamities and incidents

Describe the possible effects of external calamities, such as:
- an explosion at the nearby industrial site in Vlissingen;
- an accident at the first nuclear power plant in Borssele or the nuclear power plant at Doel (various views have been expressed that described this as the 'domino effect').

Address the consequences, particularly as regards radiation safety and security of supply. Address the consequences of other calamities with radioactive material, such as temporarily stored radioactive waste.

6.2.3 Spent nuclear fuel and radioactive waste

Provide an overview of the different types of radioactive waste that will be produced. Address the quantity, composition, radiation level, radiation duration and method of processing and storage (including final storage), and also the related risks (including radiological risks). Address the certainty that sufficient capacity will be available on time for processing and storing radioactive waste.

Provide at least the following information regarding the spent nuclear fuel and radioactive waste:
- quantities in volume (m^3) and in activity (Bq[4] per nuclide) per MWe/year;
- total quantity of spent nuclear fuel and radioactive waste as a result of reprocessing in the same units.

Describe the risks associated with transporting spent nuclear fuels and radioactive waste. Address among other things the environmental effects (such as discharges and emissions into air) as a result of accidents during transport.

6.3 Nautical safety

The following safety matters must be identified in relation to shipping:
- effects of shipping on the nuclear power plant, such as effects of a shipping calamity or crash near the nuclear power plant;
- effects of the nuclear power plant on shipping, including:
  - effects of the nuclear power plant on radar coverage of shipping (vessel traffic guidance system of the Scheldt radar chain). This includes such matters as the height of buildings, the shape and use of materials for cooling towers (if applicable);
  - effects of the cooling water outflow (with any guide dams) on the safety of passing vessels in general and future shipping for the Western Scheldt Container Terminal in particular (insofar as foreseeable);
  - effects of the lighting of the establishment on shipping (present and future situation).

6.4 Risk control and response to calamities

Identify the risk contours during normal operation, in the event of design accidents and beyond-design accidents as well as external calamities and incidents. Describe the measures that will be taken to keep the risk contours within the operating limits to the fullest possible extent. These must be feasible, sufficiently validated, proven measures.

Describe the way of controlling risks and responding to calamities in the event of events, design accidents and beyond-design accidents as well as external calamities and incidents. Take into account the release of radioactive substances as well as non-radioactive hazardous substances (such as chemicals).

Provide a transparent picture of the routing and volume of traffic in the event of a calamity in relation to the capacity of the present traffic network, taking into account traffic streams in two directions as the population will need to leave the area and the emergency services must enter the area.

Describe additionally the impact on the interaction between the initiator of the plan, the Dutch authorities and the Belgian authorities regarding emergency nuclear planning, devoting special attention to:

4 Bq stands for Becquerel, the unit that expresses radioactivity and describes the quantity of radioactive material in which one nucleus decays per second.

- exchange of information/communication during emergencies;
- coordination of disaster plans;
- competencies and responsibilities.

6.5 Soil and groundwater

The environmental component 'Soil and groundwater' encompasses the soil (solid parts), groundwater (liquid parts), ground air (gaseous parts) and soil organisms (living parts).

Describe the results of a preliminary study (in accordance with standard NEN 5725) into the possible presence of contamination in the existing situation at the site of the nuclear power plant. Based on the results of this study, address the possible consequences of the planned activity and the alternatives for the soil quality.

Describe in the EIR the possible consequences of contamination of the soil and groundwater based on expert judgment. Address at least the following matters:

- any soil decontamination that will be required under the Housing Act / Building Decree and the Soil Protection Act;
- the likelihood of soil and groundwater contamination caused by the new nuclear power plant and the resultant effects on people and the environment;
- the soil protection provisions and measures which can be taken to prevent contamination, taking into account the principles of the Dutch Soil Protection Directive.

If there will be groundwater extraction during the construction, start-up and operational phases of the nuclear power plant, it will be necessary to identify its possible effects on nature, agriculture and buildings.

6.6 Wastewater discharges

The effects of all wastewater discharges on surface water quality must be covered in the EIR. Describe the various dischargeable wastewater streams according to their nature, discharge point locations, composition and likely volume. Check this data against the Water Framework Directive (KRW) combined with the objectives included for the Western Scheldt estuary (and the Land van Saeftinghe nature reserve) in the National Water Management Plan (Bprw). This concerns both chemical and ecological requirements. The Decree on Quality Demands and Monitoring for Water (Bkmw 2009) provides the applicable regulatory framework.

Consequently, at least the following wastewater discharges must be identified:

- rainwater drainage from roofs and from the premises;
- spillage and leakage losses on the premises;
- scrubbing, leaking and rinsing water from the nuclear power plant;
- discharges of radioactive substances via cooling water;
- household wastewater from the nuclear power plant;
- residues that occur during regeneration of demineralised water and condensation;
- extraction of groundwater during construction work.

Describe the effect of wastewater discharges on the quality of surface water (i.e. chemical and ecological quality) and the consequences for people and the environment. Indicate which streams can be drained to a water treatment plant or require separate treatment on site at the nuclear power plant (or the nearby nuclear power plant, if applicable). Describe the possibilities for re-using treated wastewater or cooling water or for useful application of this water elsewhere. Indicate additionally how after cleaning the remaining substances will be treated, processed, removed and stored.

6.7 Cooling water discharges

A 3-D heat discharge model must be used to adequately describe the heat plume in the Western Scheldt estuary, taking into account the effects of a possible sea level rise. Use the 3-D model to clarify what the temperature of the cooling water will be around the discharge point and how the temperature will decrease spatially (spreading of the cooling water in the Western Scheldt).

Describe the quantity of cooling water heat, the background temperature of the receiving body of water, the seasonal fluctuations in it, the effects on ecology and the biotic environment, the temperature effects on surface water, changes of flow speeds and flow directions, the trends and also any unclear matters and uncertainties.

Check the cooling water discharges against the CIW guidelines[5]. The EIR must moreover describe the discharge of cooling water and it must have been evaluated by means of the BREF cooling[6], LBOW evaluation system for heat discharges (2005)[7] and CIW emission/immission evaluation system for substances and preparations (2000), insofar as applicable. Additionally, the guidance for cooling water issued in 2005[8] by the Inspectorate of the Ministry of Transport, Public Works and Water Management must be followed.

From the relevant evaluation framework, extract clear guidelines for modelling of (variations in) the cooling water flow rate, such as the permitted temperature increase for summer and winter regimes. Also indicate which criteria were used to assess the flow rates and heat loads, such as average situation, maximum, minimum, at which depth, different tides.

The sphere of influence of the cooling water discharge must be identified, taking into account the physical and geographical uniqueness and flow characteristics of the Western Scheldt (including tidal changes, effects of salt water and freshwater exchange and wind effects). The cumulation with all other cooling water discharges present with a thermal impact within the sphere of influence must also be examined in the modelling and in the determination of effects. The present and future total thermal load of the Western Scheldt (factoring in the maximum scenario for the planned activity in Borssele) must be calculated and evaluated. Attention must be given to the short, medium and long term effects.

Indicate at the mixing zone criterion whether the evaluation will take place based on a critical situation or based on an existing situation for surface water. Determine the mixing zone by means of 3-D modelling.

Allowance must be made for accumulative (recirculation) effects that may occur due to nearby thermal discharges. To the fullest extent possible a situation must be avoided whereby discharged cooling water from existing or newly built energy plants will be sucked in again, because this would impair energy efficiency.

Indicate the possibilities that exist to reduce the discharge flow rate or the heat load, as well as to spatially reduce the heat plume. Attention must additionally be devoted to possible alternatives for preventing fouling in the cooling water system. The preferred choice must be explained.

5 CIW stands for Integral Water Management Committee.
6 Reference Document on the Application of Best Available Techniques to Industrial Cooling Systems
7 LBOW is a Dutch abbreviation for national administrative conference on water.
8 Report entitled 'Koelwater, Handreiking voor Wvo en Whh-vergunningverleners' ('Cooling Water, guidance for licensing bodies under the Pollution of Surface Waters Act and Water Management Act'), Inspectorate of the Ministry of Transport, Public Works and Water Management (Water Division), 7 February 2005.

The above matters must be described for the entire period in which the nuclear power plant will be in service, as there are likely to be changes to water volume management during the nuclear power plant's service life and it will be almost impossible to make changes to the cooling water discharge without major investments. Among other things attention must be devoted to the possible effects of climate change on the use of cooling water.

The Western Scheldt estuary is currently being deepened and widened. The deepening will result in changes in the water flow speeds and thus exert an influence on the cooling water flows. The expected effects of deepening must be factored into the cooling water study.

6.8 Air

Identify the local and regional effects of the emissions into air during the construction phase and the operational phase of the nuclear power plant, including the corresponding transports, such as supply routes, railroads and shipping terminals, and examine them. Make allowance for any peak emissions during the start-up phase. For the operational phase, normal as well as exceptional operating conditions must be described. Typical operational emission sources are auxiliary systems, emergency and back-up systems like generators and steam boilers.

Describe the series of possible emissions by air pollution sources and potential effects, paying attention at least to particulate matter (such as PM_{10} and $PM_{2.5}$), NO_x, SO_2, CO, NH_3, VOCs, heavy metals and any radioactive substances. Emissions of CO_2 will be addressed separately in relation to the scenarios for electricity production (see Section 2.1.2).

Describe how the emissions will affect air quality, regardless of whether there will be an overshoot of limit values. Present the data for the relevant components as immission contours.

The evaluation must provide a detailed understanding of the predicted spreading and effects of air pollutant concentrations at ground level for sensitive environmental aspects, in the vicinity of the envisaged location and along transport routes. These effects must be described in relation to the existing situation (and, if relevant, to the future situation as well).

Make a check against the air quality requirements contained in the Environmental Management Act and the target values for air in the Netherlands Emission Guidelines for Air (NeR), using model calculations that satisfy the requirements of the Air Quality Assessment Regulation (2007). The check must comply with the relevant international, European and national laws and regulations.

Indicate which mitigating measures will be applied and what effects they will have when a significant effect or transgression of a relevant standard is predicted. For the evaluation, allowance must also be made for cumulative effects of the planned activity in combination with existing or new (associated) plans.

The assessment of air quality effects must address the spreading of local air pollution in relation to possible health effects and possible deposits and consequences for vegetation and ecosystems.

6.9 Noise

Define the effects of noise emissions and vibrations during the construction phase and the operational phase of the nuclear power plant and review them. Disturbance by noise and vibrations may occur in the direct vicinity of the envisaged location and transport routes, where traffic will significantly increase due to the construction of operations of the nuclear power plant. The analysis of effects must include descriptions of environmental aspects that may be sensitive to noise and vibrations, and that will possibly be disturbed by work during construction and operations.

For the analysis of effects, the noise contours of the representative operating conditions must be calculated and presented in the EIR. The study area for the assessment of effects must be defined, taking into account work on and beyond the envisaged location.

Make allowance for the distribution of noise via wind, in accordance with ISO 9613 (Acoustics – attenuation of sound during propagation outdoors) and other relevant guidelines. For the assessment of effects, take into account the locally permissible noise load laid down in the noise zoning for the industrial and port site. The EIR must further contain a calculation of whether there will be any change to the noise load on homes located within the zone.

Provide on a map the above-water and below-water noise contours during construction work and in the usage phase, including the distances to buildings (including homes).

Indicate which suitable mitigating measures will be taken and what impact they will have for (significantly) unfavourable effects of noise or vibrations. Also indicate what quantitative and qualitative residual effects will occur, where relevant. Moreover, state for which areas further information or investigations will be necessary to develop a full understanding of the possible effects or of suitable mitigating measures.

6.10 Nature

The EIR must provide an insight into the importance of the area for and the presence of flora, fauna and ecological values in the planning area and the study area. Where relevant it will be necessary to address the ecological functions and relationships of parts of the area. The effects of the planned activity on flora, fauna and ecological values and functions in the vicinity of the nuclear power plant must be described.

The planning area borders the Natura 2000 area called Westerschelde & Saeftinghe, which is subject to the protection regime of the Nature Conservation Act 1998. For external effects, account must be taken of all Natura 2000 areas, both in the Netherlands and abroad, which may be affected by the project.

In the construction and operational phases the planned activity may have consequences for the nature values in its terrestrial and aquatic surroundings. In the construction phase there is likely to be disruption caused by (underwater) noise due to pile driving[9] and by the construction of the cooling water outlet (noise, vibrations, clouding). In the operational phase there are likely to be consequences especially as regards the sucking of fish and fish larvae into the cooling water and through thermal discharges.

9 Pile driving in or near water (also on land) produces low-frequency pulse sounds with high noise levels. This can cause serious physiological harm to fish and marine mammals, including species covered by the conservation targets of the Natura 2000 area.

For a worst case scenario, too, indicate the possible consequences of effects of radioactive substance leakage, and, in case of explosion and fire, of emission and deposits of radioactive substances via the atmosphere.

Construction phase
Identify the effects that may occur during construction. Devote attention in any event to:

- habitat destruction or disturbance through construction of the nuclear power plant and associated infrastructure (cooling water system, transport infrastructure, coastline protection);
- aquatic ecology and water quality – emissions of toxic substances and nutrients into freshwater, groundwater and marine environment, sediment disturbance due to activities like pile-driving and dredging for the construction of cooling water inlets and outlets, including clouding, consequences for the local flow patterns. Include descriptions of the effects on the entire food chain as well as of the heat effects for the entire ecosystem;
- direct disturbance of flora and fauna near the construction site(s) and associated infrastructure (e.g. birds, fish, mammals, amphibians and reptiles), such as barrier effects on flying routes of birds and possibly bats;
- disturbance of habitats and species due to (underwater) noise, light and vibrations;
- air quality is an important guiding factor for terrestrial habitats: deposits of substances like NO_x and SO_2 may affect sensitive habitat types (in Natura 2000 areas, for instance)[10] and nature types (National Ecological Network), if the transport streams give rise to that. Give an accurate indication of the expected increase in NO_x and SO_2 plus a time frame and of the effects on habitats sensitive to nitrogen;
- indicate accurately to what extent (in terms of quantity and quality) work will occur in international, European and national designated protected or exceptional areas, such as the Natura 2000 area, and what effects this will have on the designated objectives, like conservation targets.

Operational phase
Describe the consequences of the in-service nuclear power plant (e.g. due to the cooling water system, discharges from land, accidents and calamities) for the surrounding vulnerable/protected nature and devote attention in any event to:

- dragging along, collisions with and sucking in of fish (including juvenile fish and fish larvae) and other organisms via the cooling water and the measures that will be taken to mitigate the adverse effects (sieving configuration with the return of fish), fish deflection caused by light and sound). Describe clearly what the effects will be on the protected values of the Natura 2000 area, also making reference to similar projects (e.g. Eemshaven). Describe the possible consequences for the entire food chain as well as the cumulative effects with other projects;
- changes in water quality and effects on underwater life:
  - chemical and/or thermal cleaning of the cooling water system during the start-up and operational phases and the consequences for underwater life;
  - the separate and cumulative effects of thermal discharges for the aquatic environment;
  - resuspension of sediment and mobilisation of contamination;
  - effects on the food chain (e.g. digestion of bromoform in fish if chlorination is used). Also address the cumulative effects;

10 The limit values of nitrogen as described in Dobben & Hinsberg 2008 should be checked ('Overzicht van kritische depositiewaarden voor stikstof, toegepast op habitattypen en Natura 2000-gebieden' – 'Overview of critical nitrogen deposition values, applied to habitat types and Natura 2000 areas', Alterra report 1654). Use the most recently measured values for the background values (Netherlands Environmental Assessment Agency, PBL). If these values are exceeded, a fitting assessment must be performed for this subject, focusing on the ecological assessment of effects.

- possible effects on morphology, such as gully migration, soil change, changes in bank gradients and sedimentation, and the resultant effects on plant and animal life. Also address the cumulative effects with other projects (channel maintenance, etc.);
- discharges on land and into groundwater;
- disturbance of habitats and species due to (underwater) noise, light and vibrations;
- effects on nature values of calamities causing radioactive substances to end up in water or in the atmosphere;
- emergency overflowing of wastewater basins, surface water discharges (such as leakage of oil, fuels and chemicals);
- narrowing of the coastal zone – the loss and fragmentation of habitats due to the sea level rise and coastal stabilisation structures (e.g. sea walls).

Effects for protected areas and species

- Describe the effects of the plan for the conservation targets of the Natura 2000 area of Westerschelde & Saeftinghe, separately and cumulatively. Also devote attention explicitly to the indirect effects (food chain) and where knowledge gaps exist assume worst case scenarios. Indicate what the knowledge gaps mean for the assessment of effects and ensure that these findings can be found in the monitoring programme as well.
- Describe the consequences of the planned activity for the main characteristics and values of surrounding areas which are part of (a) Ramsar area(s)[11]
- Describe any consequences for the fundamental characteristics and values of the surrounding areas of the National Ecological Network[12].
- Describe the likely changes in the populations of protected and/or Red List species as a result of the planned activity and/or alternatives[13].
- Indicate the approach that will be adopted to the (possible) establishment of protected pioneer species and how this will be dealt with[14].
- Evaluate the influence of the planned installation on bat and bird migration routes.

If significant adverse effects for the Natura 2000 areas for which conservation targets have been designated cannot be ruled out as yet, the EIR must contain an appropriate evaluation[15]. An assessment must be included of whether the initiative will actually have significant effects on the conservation targets of the Natura 2000 area and to what degree mitigating measures can remove this significance by preventing loss of quality and disturbance. Cumulative effects must also be described.

Mitigating measures

Describe which mitigating measures can be taken to reduce or remove the effects referred to above. Then describe the residual effects that cannot be mitigated and re-assess these effects for their importance and significance.

11 Westerschelde & Verdronken Land van Saeftinge was designated as a Ramsar site in the Ramsar Convention of 1971 (see http://www.wetlands.org/reports/ris/3NL017en.pdf for details).

12 For an overview see http://zldims.zeeland.nl/geoweb). Under the Rules for the National Ecological Network it is necessary to check only interventions *in* the network, but the EIR must identify the environmental impact on the network via external effects.

13 This analysis may be confined to protected species (Table 2, Table 3 and birds covered by the 'Exemption Decree; General Administrative Law Act, Section 75 of the Flora and Fauna Act) and any other relevant species such as those on the Red List. The EIR should also include the information that is necessary in order to request any exemption that may be required. Explain why it is assumed that exemption can be granted. Bear in mind that in principle exemption cannot be requested for the disturbance of breeding birds (gulls are among the birds that breed in the area).

14 Likely (heavily) protected pioneer species include the natterjack toad, sand martin and little ringed plover. Check whether it is possible/desirable to invoke the 'temporary nature' regulations.

15 Section 19f (2) of the Nature Conservation Act 1998 states that the appropriate evaluation may form part of the Environmental Impact Assessment (E.I.A). The explanatory memorandum accompanying the Act puts this more strongly, i.e. that the appropriate evaluation forms part of the E.I.A. The statutory regulations for a Strategic Environmental Assessment state that the appropriate evaluation must form part of the EIR.

If it appears that certain significant adverse effects still cannot be ruled out, the so-called 'ADC criteria' must be applied, meaning that alternatives, the compelling reason of great public importance and compensation must be described. Compensation must be realised before the start of the project.

6.11 Landscape, cultural heritage, geology and archaeology

Landscape and cultural heritage
The nuclear power plant will be built on a large industrial site. The height of the buildings is approximately 60 metres and the height of the ventilation shaft is approximately 100 metres. The plan does not envisage any cooling towers. If the EIR includes alternative cooling by means of one or two cooling towers, it will be necessary to provide a picture of the effects of this on landscape and cultural heritage.

The nearby national landscape of south-west Zeeland includes the 'Zak van Zuid-Beveland' area, a marine clay area that is highly valuable in terms of landscape and cultural heritage. The area of Westerschelde & Saeftinge is characterised by its great openness.

In view of the size of the buildings of the planned activity they will be visible from a great distance and will therefore affect the landscape. For this reason the EIR must include an analysis of the buildings' visibility combined with the sensitivity of the historical, open landscapes. The meteorological visibility limits must be taken into account in this analysis.

Apart from the above-named visual effects on the landscape, also describe the other effects on values in terms of cultural heritage and landscape, particularly the consequences for the above-named landscapes and the (historical) landscape elements in them.

Additional to a description on a map and in images and/or photo montages, it is necessary to indicate the changes that will occur in the present specific characteristics and values of the landscape, cultural heritage and geomorphology. Address specifically image determiners, lines of sight, cultural heritage and geological values, and the readability of these values. Also indicate the measures that will be taken to retain, restore or strengthen these specific characteristics and values.

The description of the effects on landscape and cultural heritage must be approached in a structured way. The following steps are conceivable in this regard:
- a description – in words and images – of the landscape, cultural heritage and geological values subject to possible effects;
- a valuation in terms of cultural heritage of the defined types of landscape and landscape elements at different scales, based on (regional) distinctive characteristics, rarity, pristine condition and replaceability;
- a description – in words and images – of the effects of the planned activity on the above-named geological, cultural heritage and landscape values;
- a description of the effects of the planned activity on the structures and the cohesion between them in the study area. These must be visualised as well;
- also devote attention to elements of past usage of land that might be useful during development of a robust connection.

State whether any conflicts exist between retaining/developing the landscape and cultural heritage on the one hand and the nature targets on the other.

Geology

Describe any changes to the environment as a consequence of the removal of bedrock and types of soil that will be discharged or used for construction purposes. Also include an assessment of the changes to the coastal zone due to effects like erosion and sediment transport, devoting special attention to the consequences of the increased discharges into surface water.

Archaeology
In the context of the Valletta Convention, an investigation into any archaeological values in the soil will be required. Include in the EIR a description of the expected archaeological values for the planning area. If such desk research suggests that archaeological sites may be present, this must be verified by means of a field investigation.

The EIR must clarify the extent and the boundaries of any archaeological sites, and state whether they are worth preserving. To this end the research steps of desk research, exploratory field research – surveying phase and evaluating phase – must be conducted for the EIR, insofar as the preceding research steps suggest that they are required.

If archaeological values may be affected by the plans, those values must be further defined by means of exploratory field research for digging locations. Archaeological investigations must be fully in accordance with the applicable version of the Quality Standard for Archaeology in the Netherlands (KNA).

6.12 Cross-border environmental effects

Describe in the EIR the cross-border environmental and safety effects. Address among other things the reach of the noise effects in the construction and operational phases and also the landscape and visual impact of the various design alternatives (such as cooling towers, if applicable). In any event also address any radioactive emissions that may be spread to such an extent that they will have a cross-border effect.

7 Other aspects

7.1 Proliferation aspects

It is important to ensure that knowledge, technology and materials will not be used for undesirable purposes. For the future nuclear power plant contracts will be concluded for deliveries of nuclear fuel from installations subject to international supervision by such bodies as Euratom and the IAEA. The use of existing, properly controlled installations for deliveries of nuclear fuel will not change the international situation regarding misuse of nuclear technology as agreed under the auspices of the UN.

The EIR must include a description of how this undesirable distribution will be prevented insofar as this information is public and will not jeopardise national safety. Specify the levels of safety checks, responsibility for stored nuclear fuel and communication with Euratom and the IAEA.

7.2 Social and economic effects

The construction and operations of a nuclear power plant of the size envisaged in the planned activity may have considerable consequences during the construction and operational phases for the social and economic situations within the region surrounding the nuclear power plant and the province of Zeeland.

Provide an overview in the EIR of the social and economic effects that can be expected at the local, regional and provincial level in relation to the planned activity. Address at least the following matters:

- distribution and density of the population;
- expected number of (temporary) construction staff and staff of the nuclear power plant and the associated temporary, long-term or permanent accommodations and general facilities;
- local economy and employment market: effects on local commerce and employment, including cultural and recreational effects;
- utilisation rate of the local infrastructure.

In this description, distinguish between the existing situation, the construction phase and the operational phase. Describe the environmental consequences to be expected, like possible nuisance due to increased noise, air pollution, waste, etc., and the possible effects of these consequences for public health. This especially involves the expected environmental effects due to the social and economic aspects described above. These are additional effects beside the environmental effects due to the construction and operational phases (as described in Chapter 6 of these guidelines).

Also list the possible measures to reduce the expected adverse effects and nuisance to a minimum.

7.3 Gaps in environmental information

For the description of the reference situation and the assessment of environmental effects, set out explicitly the environmental aspects for which no or insufficient information can be included due to a lack of data. Describe the (extent of the) uncertainties that continue to exist as a result, stating reasons, and describe the degree to which this affects the assessment of effects. Indicate in the EIR the relevance and potential consequences of the gaps in knowledge and of the

uncertainties for the decision that must be taken. Give an indication of the extent to which the information might become available in due course, and what is needed for this to occur.

7.4 Monitoring and evaluation programme

Address the monitoring of the cooling systems, ventilation (chimney), transport movements of materials (inward as well as outward) and the monitoring of persons entering and leaving. Link the information described in the chapter on gaps in knowledge to the monitoring programme to eliminate any uncertainties with a view to the assessment of effects.

Provide a description of the local surveillance programme. The existing local surveillance programmes for measuring radioactivity in the air, soil, water (in terms of quality as well as quantity), flora and fauna and food chain in the immediate and wider vicinity of the Borssele site must be described in the EIR. Also refer to the data validation performed by using proven distribution models and assumptions with regard to source, route and terminal point. The need for alterations or additions to the local surveillance programme must be evaluated.

Describe the way of assuring optimum control of safety. Consider such matters as maintenance programmes, education and training of personnel, internal and external audits, periodical safety evaluations, the evaluation of incidents (at this establishment and elsewhere) and the international cooperation arrangements in this regard. Also consider conduct and attitudes regarding safety, and the possible consequences for safety culture and organisation structure.

Include in the EIR a step towards a monitoring programme for underwater noise. Indicate how measurements will be performed for the existing situation (baseline measurement) and for the periods before construction, during construction and during operation of the activity. Describe the expected noise measurement method. Also consider the monitoring of affected species such as marine mammals and fish and cumulation with the many other sound sources.

In its decision the competent authority must state how and when an evaluation study will be performed in order to compare the predicted effects and those that actually occur and if necessary take mitigating measures. It is advisable for Delta to take an initial step in the EIR towards setting up an evaluation programme and to establish a connection with the observed gaps in information and uncertainties. The action(s) taken by Delta will need to be laid down in more detail by means of a commitment concerning a timeline and objective.

8 Form, presentation and summary of the EIR

The EIR must be drawn up in a way that makes it comprehensible by and accessible to the public at large.

Special attention should be devoted to the presentation of the comparative evaluation of the alternatives. The comparison should preferably be presented by means of tables, figures and maps. For this presentation it is further advisable to:

- keep the EIR as concise as possible, among other things by not stating background data (for the validation of conclusions, predictions and choices) in the main text but placing them in an annex;
- provide with the EIR a glossary, a list of used abbreviations and a list of reference documents;
- use recent maps if maps are included in the EIR, showing topographical names legibly and with a clear legend.

Add an overview that shows where the data required under these guidelines can be found in the EIR.

Classified information

A situation may occur whereby some parts of the EIR can be validated only by means of classified documents, because they contain terrorism-sensitive information, for example. Under Section 19.3 of the Environmental Management Act it is possible to keep such information secret at the request of the initiator of the plan and at the discretion of the competent authority.

Summary

The summary is the part of the EIR that will be read mainly by administrative bodies and by participants in the consultation round. Therefore, this part of the report requires special attention. The summary must be readable as a stand-alone document and must be a good reflection of the contents of the EIR. Figures, maps or drawings must support the text in the summary.

The summary must contain the most important matters, such as:

- principal decision-making items;
- planned activity and the alternatives;
- most important effects on the environment and safety if the planned activity and the alternatives are carried out;
- comparison of the alternatives and the reasons for the choice of the most environmentally friendly alternative and the preferred alternative;
- comparison with other options for producing electricity;
- important gaps in knowledge and their consequences for the evaluation of the environmental effects and safety.

9 Signature

The Minister of Housing, Spatial Planning and the Environment,
also acting on behalf of
The Minister of Economic Affairs;
The Minister of Social Affairs and Employment;
and in agreement with:
The Minister of Transport, Public Works and Water Management;
The Minister of Agriculture, Nature and Food Quality.

J.C. Huizinga-Heringa